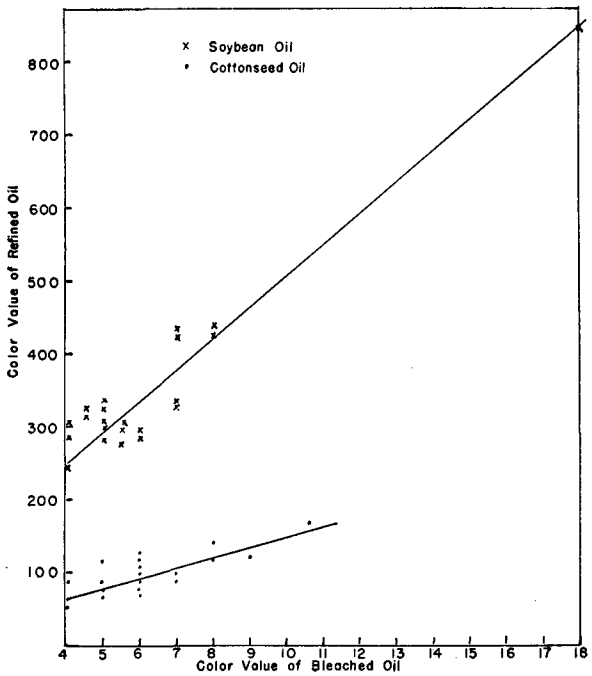

FIG. 6. Color value of laboratory refined and bleached oil.

Summary

A means for evaluating oil color on the basis of an optical density measurement at 500 millimicrons has been proposed. The amount of chlorophyll would be taken into account by present methods or an adaptation of these methods.

The advantages of the proposed means of evaluating oil color are that it expresses more exactly the amount of color in the oil, provides a more accurate estimate of color removal during bleaching, and makes possible more exact evaluation of bleaching earth.

Data have been presented on the color value (Optical Density × 100) of refined and bleached oils, possible variation in value obtained from different laboratories, estimation of color removed during bleaching, evaluation of bleaching earth, and relationship between color of refined and bleached oils prepared in the laboratory by the Official Method.

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[Received October 18, 1956]

The Fatty Acid Composition of the Seed Fat from Swietenia Macrophylla

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THE SEED FATS of the *Meliaceae* family have not been studied in any great detail. One member of this family, *Swietenia macrophylla*, is an important timber tree in various parts of India, particularly in the Himalayan regions. Its seeds are rich in fat and contain swietenolide, a bitter principle, which has possibilities in pharmacy. The composition of the seed fat from *S. macrophylla kina*, grown in Mexico, was reported by Munguia and coworkers (1), who found possibilities for the utilization of this oil. Further investigation of this oil by the methods of low temperature crystallization and ultraviolet spectrophotometry seemed desirable.

The seeds are oblong in shape and have a thin pericarp. Extraction with petroleum ether (b.p. 40–60°C.) yielded 50% of a clear yellow oil, having a bitter taste. Properties of the oil were as follows:

Refractive index at 40°	1.4692
Saponification equivalent	292.4
Iodine value (Wijs)	109.7
Free fatty acids, percentage as oleic	0.6
Unsaponifiable matter, percentage [a]	1.1

[a] A.O.C.S. method (2).

Mixed fatty acids isolated from the saponified oil had a saponification equivalent of 280.3 and an iodine value of 114.9. Linoleic and linolenic acid contents were estimated by the alkali isomerization-spectrophotometric method of Hilditch and coworkers (3). The oleic acid content was calculated from the iodine value, after allowing for linoleic and linolenic acids. It was assumed that no palmitoleic acid was present and that the only monounsaturated, diunsaturated, and triunsaturated acids were oleic, linoleic, and linolenic acids, respectively.

The mixed acids were first fractionated by crystallization from a 10% solution in acetone at −60°C. The solid fraction was further fractionated by crystallization from a 10% solution in ether at −20°C. The crystallization scheme, yields, and iodine values of the fractions are shown in Figure 1.

Each fraction was analyzed spectrophotometrically, and the results are summarized in Table 1.

Fraction A (acetone-soluble) was converted into methyl esters, which were then distilled under vac-

TABLE I

Spectrophotometric Analysis [a] of Acid Fractions

Fatty acid fraction	Total	A	B	C
Iodine value	114.9	38.9	102.2	156.9
$E^{1\%}_{1cm.}$ at 268 mμ (170°/15 min.)	64.0	18.0	56.0	87.0
$E^{1\%}_{1cm.}$ at 234 mμ (180°/60 min.)	350.0	112.0	302.0	473.0
Acid composition, %				
Linolenic	11.5	3.2	10.1	15.7
Linoleic	31.3	10.3	38.0	42.3
Oleic	29.4	12.6	6.3	41.4
Saturated	27.8	73.9	45.6	0.6

[a] According to method of Hilditch and coworkers (3).

TABLE II

Fractionation Data for the Methyl Esters of Fraction A

Fractions	Weight (in g.)	Sapon. equiv.	Iodine value	Saturated Esters (g.)			Unsaturated Esters (g.)	Non-sap.
				C_{16}	C_{18}	C_{20}		
A_1	0.90	273.8	21.1	0.75	0.02		0.13	
A_2	1.92	282.4	29.9	0.86	0.66		0.40	
A_3	1.71	283.8	34.9	0.68	0.61		0.42	
A_4	1.81	284.7	38.9	0.76	0.55		0.50	
A_5	1.44	285.0	38.5	0.60	0.45		0.39	
A_6 (residue)	4.20	301.5	49.5		2.48	0.29	1.39	0.04
Total	11.98			3.65	4.77	0.29	3.23	0.04

uum through an electrically heated and packed column. Analytical data for the six cuts are shown in Table II. The proportions of the saturated fatty acids in these cuts were calculated from the saponification equivalents and iodine values according to the method of Hilditch (4). The saturated acids in fractions B and C were estimated from their ratios in Fraction A. The calculated mean values for saponification equivalent and iodine value of the mixed fatty acids were 277.9 and 115.3, respectively, and of the glycerides 290.6 and 110.3, respectively.

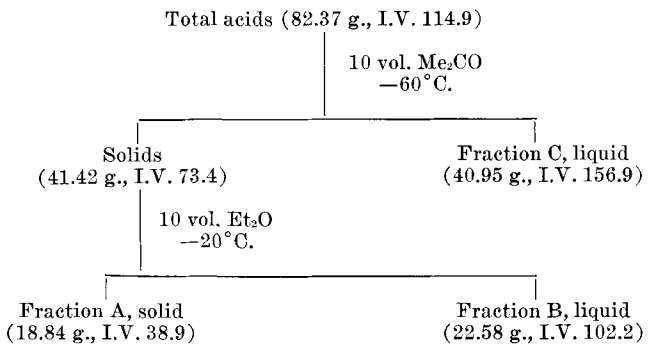

FIG. 1. Crystallization of fatty acids from *Swietenia macrophylla* seed fat.

Discussion

Comparison of the data in Tables I and III shows that the results of the analysis of the mixed fatty acids by the spectrophotometric method agreed closely with those obtained by fractional crystallization and distillation of the methyl esters.

As is shown in Table IV, the fatty acid composition of the fat from *Swietenia macrophylla kina*, grown in India, differed significantly from that grown in Mexico as determined by Munguia and coworkers. The proportions of the saturated and oleic acids were nearly the same in the two oils, but there was considerable difference in the contents of the more unsaturated acids. This difference probably resulted from species or varietal factors rather than from analytical techniques.

TABLE III

Calculated Composition of Acid Fractions

Fatty acids	Weight percentage				Mol percentage
	A	B	C	Total	
Palmitic	6.97	5.40	0.13	12.50	13.57
Stearic	9.16	7.09	0.17	16.42	16.07
Arachidic	0.56	.....	.....	0.56	0.48
Oleic	2.99	1.73	20.58	25.30	24.94
Linoleic	2.44	10.41	21.02	33.87	33.62
Linolenic	0.78	2.77	7.80	11.35	11.32

TABLE IV

Composition of Fatty Acids from *Swietenia macrophylla kina*

Origin	India	Mexico[a]
Saturated acids, %	29.48	26.06
Palmitic	12.50	.....
Stearic	16.42	.....
Arachidic	0.56	.....
Oleic acid, %	25.30	24.86
Linoleic acid, %	33.87	49.08
Linolenic acid, %	11.35	nil

[a] As reported by Manguia *et al.* (1)

The fatty acid composition indicates that the seed oil from the Indian variety of *S. macrophylla kina* would be useful for soap-making and other purposes, even for the preparation of a drying oil by solvent segregation. Debittering of the oil for edible purposes may be feasible since this has been accomplished with neem oil, which is isolated from *Azadirachta indica*, another member of the *Meliaceae* family.

Summary

A light yellow oil was isolated in 50% yield from the decorticated seeds of *Swietenia macrophylla kina* grown in India. The unrefined oil had a slightly bitter taste and an iodine value of 109.7. Other properties are reported.

By means of spectrophotometry, fractional crystallization, and methyl ester distillation, the oil was found to have the following fatty acid composition (as %): palmitic, 12.50; stearic, 16.42; arachidic, 0.56; oleic, 25.30; linoleic, 33.87; linolenic, 11.32. These values for linoleic and linolenic acid differ considerably from those previously reported for an oil from the same species grown in Mexico.

Acknowledgment

The authors are indebted to N. K. Sen, director of Forensic Science Laboratory, Calcutta, for supplying authentic specimen of the oil seeds and for his keen interest in the work.

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[Received February 6, 1956]